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Cover

The Geostationary Operational Environmental Satellite-1 (GOES-1), the first operational version of the Synchronous Meteorological Satellites launched by NASA for the National Oceanic and Atmospheric Administration, took this view of the Earth on Oct. 25, 1975. Clearly shown are North and South America and the west coast of Africa.

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Monthly NASA Highlights

NASA Float in California Parade

A float saluting America's Space Program and featuring the Viking mission to Mars appeared in the recent Tournament of Roses parade at Pasadena, CA.

The Native Sons and Daughters of the Golden West sponsored the float and teamed with the Langley Research Center and the Jet Propulsion Laboratory for its design and preparation. The theme of the float was appropriately "The Search for Life." Viking was featured since, in addition to being the nation's latest scientific venture in space, it is considered a major undertaking during the U.S. Bicentennial year.

The rear of the float was dominated by a large Earth globe with floral swirls extending 12 feet to a Moon globe. A larger cantilevered swirl covered with roses extended about 30 feet forward supporting a floral replica of the Viking Orbiter 16 feet above the Lander on a flower-decked simulation of the Mars surface. A full-scale model of the Lander was situated below the Orbiter.

On the Orbiter was an animated simulation of a camera and radio antenna scanning the surface below, while the Lander—not a floral replica but a full-scale spacecraft display model lent for the occasion by NASA—featured a maneuverable surface sampler boom.

A waiver of the flower decoration rule was given by the Tournament of Roses Association so that viewers could see the Lander as it is.

The Tournament was designated as the initial event touching off the year-long Bicentennial celebration. The NASA float commemorated in advance the Viking landing on Mars next July.

Millions View Viking Float—Clouds of flowers surround a floral Earth and Moon and a petaled Viking Orbiter soars over a full-scale Viking Lander on a simulated Martian surface composed of more flowers. NASA was represented by the float, a tribute to "The Search for Life," in the 87th annual Tournament of Roses parade in Pasadena, Calif., home of the Jet Propulsion Laboratory. It and the Langley Research Center share responsibility for management of the Viking mission, scheduled to touch down on the Martin surface in mid-1976. The parade entry, sponsored by the Native Sons and Daughters of the Golden West, was designed and constructed in cooperation with NASA personnel.

Dual Air Density Spacecraft Fails to Orbit

Launch of the Dual Air Density (DAD) spacecraft was attempted from the Western Test Range on Dec. 5, 1975, with a Scout launch vehicle, but a malfunction in the Scout's third stage resulted in loss of vehicle control and failure of the spacecraft to achieve orbit.

The dual satellites were designed to measure the composition of the upper atmosphere. A committee, chaired by Claude W. Coffee of the Langley Research Center, is investigating the vehicle anomaly.

First Launch of Delta 3914 Is Successful

The RCA-A spacecraft was successfully launched into a synchronous transfer orbit from Cape Canaveral on Dec. 12, 1975, by a Delta 3914 launch vehicle. This spacecraft is the first of a series of RCA-Globcom commercial communications satellites capable of transmitting voice, data, facsimile and telex messages to and from the continental United States, Alaska, and Hawaii. The Delta model 3914 was equipped with the larger Castor IV thrust-augmentation booster strap-on motors instead of the standard Castor II motors.

Adaptation of the Castor IV motors by the Thiokol Corp. and development of associated booster modifications by the Delta prime contractor, McDonnell-Douglas, was accomplished at no cost to the Government. NASA provided technical direction of the development effort and, upon its successful completion, as well as that of associated testing, gave approval to launch the new Delta configuration.

The Goddard Space Flight Center manages the Delta Program for NASA's Office of Space Flight and also has responsibility for the tracking network. Launch operations are managed by the Kennedy Space Center's Unmanned Launch Operations.

1975 Launch Summary

During 1975, NASA successfully launched 19 payloads into orbit in 21 attempts. These launches included a variety of satellites for scientific and applications purposes, the last manned Apollo flight, and spacecraft for foreign nations and commercial firms. Eight of them were on a reimbursable basis.

The Delta launch vehicle successfully placed 12 spacecraft into orbit during the year for a total of 108 successful launches in 118 attempts. A new Delta configuration, the Delta model 3914, was used for the first time and was equipped with the larger Castor IV thrust-augmentation booster strap-on motors instead of the standard Castor II motors. This vehicle was used to launch the RCA-Globcom mission into orbit and performed flawlessly.

The Atlas-Centaur successfully launched two of three Intelsat communications spacecraft into orbit for the Comsat Corp. The Viking A and B spacecraft were successfully launched by Titan III Centaur vehicles on their journey to search for life on Mars.

The Scout vehicle was used for three launches during the year. During the launch attempt of the Dual Air Density mission, a malfunction in the Scout's third state resulted in loss of vehicle control. A command destruct signal was executed before the spacecraft attained orbital velocity.

The ASTP project with the USSR used a Saturn IB vehicle for the U.S. portion of the mission, ending an era of launches for the large Saturn rockets.

Television Equipment Lent Bowie State College

In an effort to enhance the professional development of students at the Center for Educational Technology and Communications at Bowie State College, MD, the Goddard Space Flight Center has made available to it television equipment under an equipment loan agreement. This action is a continuation of GSFC's efforts to expand cooperation with colleges and universities with predominantly minority enrollment.

Dr. Ramey Opens Goddard Federal Women's Week Program

Dr. Estelle Ramey, Professor of Physiology and Biophysics at Georgetown University's School of Medicine, who has received national recognition for her effective and articulate encouragement of women in pursuing demanding careers, was the keynote speaker at the recent Federal Women's Week program at the Goddard Space Flight Center.

Pioneer 11 Photographs Saturn

The Pioneer 11 spacecraft, now about 800 million miles from Saturn and scheduled to reach it in 1979, has transmitted its first picture of that planet back to Earth. Saturn appeared a little larger than a dot. No rings were visible.

In December, 1974, Pioneer 11 made a flyby of Jupiter, returning the only pictures taken of the polar regions and obtaining data on the planet's radiation belts. It used Jupiter's gravity to send it on a trajectory towards Saturn.

Despite the intense radiation of Jupiter, the spacecraft's instrumentation is still functioning well. As it travels nearer to Saturn, regular data observations of the planet will be transmitted to Earth.

Pioneer 6 Still Operating After 10 Years in Space

On Dec. 16, 1965, a Pioneer spacecraft weighing 140 pounds was launched by a Delta launch vehicle. The satellite was designed to operate for six months and to return data on the Sun and interplanetary space.

After 10 years, this small spacecraft is still transmitting valuable data on the Sun, solar wind, solar wind cosmic rays, and solar magnetic field, thus establishing what is believed to be the longest operating life ever attained by an interplanetary spacecraft. It has circled the Sun about a dozen times and has traveled in space more than six billion miles. ■ ■ ■ ■ ■ ■

Pioneering Work of ATS-6 Is Recognized—NASA recently was the recipient of a group award for the development of its Applications Technology Satellite ("The Teacher in the Sky") as an important aid to educational television. The award was given by the Committee on Social Justice of the National Association for Public Continuing and Adult Education. Ruth Bates Harris, NASA's Deputy Assistant Administrator for Community and Human Relations, accepted the award on the agency's behalf at ceremonies held in Chicago. Shown here are four of the honorees at a press reception held in conjunction with the Committee's annual conference. Standing on either side of T. N. Kaul, Indian Ambassador to the U.S. are (l. to r.): Rosalinda Valino of the Philippines; Dr. Shoshana Sharni of Israel; Ms. Harris; and Dotun Laja of Nigeria.

NASA Scientists Attend Mideast Workshop

Water hyacinths are on their way to becoming botanical superstars. They captured the attention of numerous individuals and organizations in the United States and abroad after NASA described experiments (see NASA Activities, Feb. 1975) directed toward using the plant to filter impurities from water.

International attention was focused on the prolific plant in late November when two NASA representatives, six scientists from other U.S. government agencies and a U.S. university, and a number of foreign scientists (from Germany, Egypt, Indonesia, Mozambique, Ethiopia, Kenya, and other countries) attended a workshop at the invitation of the Sudanese government.

The workshop, held in Khartoum and Cairo, was convened specifically to discuss problems caused by the vast quantities of water hyacinths present in the White Nile River. The nine-day meeting was sponsored jointly by the Sudanese National Research Council and the U.S. National Academy of Sciences.

NASA was represented by biochemists William C. Wolverton and Mrs. Rebecca McDonald, both on duty at the National Space Technology Laboratories, Bay St. Louis, MS. Wolverton's work, funded by the NASA Office of Applications, has stimulated worldwide interest in the experimental systems developed at NSTL to take advantage of the versatile bloom.

Workshop attendees, who surveyed by plane and boat the Nile regions affected by overgrowth of the plant, said that water hyacinths all but choke some 600 miles of the White Nile, posing a real threat to the welfare of the large human populations living along its banks, which depend on the river for many life necessities.

The visitors were able to recommend approaches to control and utilization of the plant in a 120-page report produced after a series of meetings. The NASA contribution was to demonstrate how pollutants can be removed from water by use of the water hyacinth; how bio-gas can be produced from plant residues, thus generating a new fuel supply; and how animal feed can become a byproduct of the aquatic plant. Sudanese and Egyptian officials said they plan to continue to seek the advice of NASA experts by correspondence, as the two countries attempt to put the recommended corrective measures into effect.

Lavish Growth of Aquatic Plants—Acres of water hyacinths are in bloom, under cultivation, in specially constructed lagoons adjacent to the National Space Technology Laboratories, Bay St. Louis, MS. Photo above shows a close view of a water hyacinth bloom, which is white with an ice-blue center.

Volunteers Complete Important Test

Working under the watchful eyes of principal investigators, volunteer payload specialists recently completed a five-day concept verification test at the Marshall Space Flight Center's general purpose laboratory. The success of the endeavor demonstrated that a non-PI crew can be trained to operate experiments in space while principal investigators monitor procedures from the ground—which was the purpose of the test.

Applicants for the two crews that participated in the test were selected by a computer program, and crew candidates were chosen after a written examination and a two-day pre-mission simulated flight. They were trained by the same PIs who later conducted the tests.

The laboratory in which tests took place is approximately the same size and shape as Spacelab, which is being built in Europe as a payload for the Space Shuttle. Scientists will work in the Spacelab in a shirtsleeve environment.

New Appointment in OAST at Headquarters

Dr. Lynwood P. Randolph

Dr. Lynwood P. Randolph in late 1975 was made program manager for advance electronic materials in the research division of the Office of Aeronautics and Space Technology.

The related research activities are conducted at Langley Research Center and the Jet Propulsion Laboratory. They encompass fundamental studies of high temperature superconductivity, metal oxide semi-conductors and photovoltaic materials. An objective of the program is to develop more efficient solar energy conversion.

In his new capacity, Dr. Randolph also serves as executive secretary of the OAST Research Council. Composed of NASA representatives, the council evaluates all the basic research conducted by NASA Centers and administers the Fund for Independent Research in Universities.

Ford Praises Cost-Saving Effort of NASA Technician

Joseph E. Mears, electrical engineering technician at the Wallops Flight Center, recently received direct praise from President Ford for a suggestion he made that has resulted in an annual saving in energy costs of $5,180.

In recognition of his efforts, Mears recently was presented the Presidential Cost Reduction Award, becoming one of the first NASA employees to be saluted under the White House cost-reduction campaign. He recently received the following letter from the President:

White House Recognition—J. Edward Mears (right) is presented the Presidential Cost Reduction Award by Robert L. Krieger, Wallops Flight Center Director, in recognition of his suggestion that has resulted in an annual reduction in energy costs of $5,180.

"It is a special pleasure to congratulate you on your efforts to reduce the cost of government and conserve resources.

"As we wage this critical flight to control recession and inflation, it is heartening to learn of the vital contributions you are making to this task. The $5,180 saved through your efforts will assist us in providing more economic and efficient government to all citizens.

"You are to be commended for your work in improving Government operations and for the outstanding example you have set for all employees. In the time ahead, I urge you to continue applying your talents and abilities to the challenges before us.

"On behalf of our fellow Americans, many thanks for a job well done."

Federal Women's Day Function—The U.S. Army and NASA sponsored a December Federal Woman's Day at the Marshall Space Flight Center. It was attended by more than 200 employees of Army agencies and MSFC, along with leaders of local women's organizations and officials of Huntsville and Madison (AL) counties. Seen in this photograph are speakers at the event and officials of both agencies (left to right): Oceola Hall, NASA Federal Women's Program coordinator; Richard G. Smith, deputy director of MSFC; Allene Pendergrast, Federal Women's Program coordinator for the Health Service Command at Fort Sam Houston, TX; Brig. Gen. Grayson D. Tate, Jr., deputy commanding general of the U.S. Army Missile Command; Karen Keesling, director of the Office of Women's Programs at the White House; and Brig. Gen. John G. Jones, commanding general of the Ballistic Missile Systems Defense Command.

Slayton Heads Shuttle Approach and Landing Project

Donald K. (Deke) Slayton, Docking Module Pilot on the Apollo Soyuz Test Project mission, has been appointed to the newly-created position of Deputy Director of Flight Operations for Approach and Landing Test at the Johnson Space Center.

In his new position, he will report to Kenneth S. Kleinknecht, Director of Flight Operations for the Space Shuttle Project, and will be responsible for planning and implementing the Approach and Landing Test Project for the Shuttle program.

Slayton was one of the original seven Mercury astronauts. He became coordinator of astronaut activities in September, 1962, and was named Director of Flight Crew Operations in November, 1963. He relinquished the latter position the following February to assume the duties of an ASTP crewman.

KSC Extends Florida University Freeze Prediction Study

A contract for study of the application of thermal and infrared imagery in the development of an effective freeze prediction model, originally awarded the University of Florida Institute of Food and Agricultural Sciences by the Kennedy Space Center in 1973 and renewed in 1974, has been extended again.

Freeze prediction research is directed toward development of a computerized system dependent upon thermal scanning and infrared imagery from spacecraft and aircraft. It is considered of great importance to Florida citrus growers, as well as truck farmers and other agricultural interests in all areas where freeze conditions occasionally occur.

Freeze warning information in Florida now is provided by the National Oceanic and Atmospheric Administration (NOAA) from its Ruskin, FL, facility, which uses data from 300 recording thermometers operated by a cooperative federal-state agricultural weather system

and other reporting stations.

In connection with the study, all thermal data are brought by the researchers to KSC for analysis in its Earth Resources Data Analysis Facility, after which they are taken to the University and NOAA facilities for predictive model development.

Dr. Stuhlinger Retires from NASA

Dr. Ernst Stuhlinger, Associate Director for Science at the Marshall Space Flight Center, retired from NASA recently after 30 years of Federal service.

A physicist born and educated in Germany, he had been involved in rocketry and space work since 1943 when he joined the rocket development team at Peenemunde in that country. At the end of World War II, he came to the United States and worked for the Army for several years before transferring to NASA when the Marshall Center was established in 1960.

Under his direction, early planning for lunar exploration and the Apollo Telescope Mount (ATM) was carried out. The ATM, flown on Skylab, produced much new scientific information on the Sun. He was also responsible for the early planning on the High Energy Astronomy Observatory and contributed to the initial phases of the Space Telescope project.

Women under Pressure

Three scientists based at the Marshall Space Flight Center recently completed "dry" training in pressure suits, the last step before "wet" training in pressure suits underwater in the MSFC neutral buoyancy simulator. They are Dr. Mary Helen Johnston, Carolyn Griner, and Ann Whitaker, in special training for their assignment, which is to develop materials experiments to be executed in space.

Last summer the three women studied in the altitude simulator at the Craig Air Force Base, Selma, AL, and later completed a course in the neutral buoyancy simulator at MSFC, using SCUBA gear. Such studies help the scientists to familiarize themselves with various aspects of work that will be performed in the weightless environment of space.

Johnston, Griner, and Whitaker are old hands at space flight experimental work—they were principal investigators on 11 experiments carried out at MSFC's general purpose laboratory, which is an imitation Spacelab. Johnston and Griner were principal investigators on one of several materials processing experiments flown last December on a sounding rocket launched from the White Sands Missile Range, NM.

All Suited Up—Dr. Mary Helen Johnston (left) and Carolyn Griner help each other with adjustments to their pressure suits, worn by the scientists as part of a special training course that culminates in lessons underwater in pressure suits. The "wet" training takes place at the Marshall Space Flight Center's neutral buoyancy simulator. Johnston, Griner, and Ann Whitaker, stationed at MSFC, are assigned to the development of materials experiments to be conducted in space. Ann Whitaker (above) has more than enough room in her pressure suit.

New Method for Experimental Processing of Materials Is Tested

For the first time, scientific experiments related to the processing of materials under nearly weightless conditions were carried aboard a sounding rocket launched in late 1975 from the Army's White Sands Missile Range, NM. The Space Processing Applications Rocket (SPAR) carried nine such experiments in a 143-kilogram (340-pound) science payload designed and assembled at the Marshall Space Flight Center.

The Black Brant VC sounding rocket used in the mission provided about five minutes of near-weightlessness (one ten-thousandth of Earth's gravity) during the coast phase of its sub-orbital ballistic trajectory. It reached an altitude of approximately 225 kilometers (140 miles) and traveled down range about 80 km. (50 mi.). The SPAR payload was recovered by parachute, in excellent condition, for analysis of the individual experiments and for re-use of the experiment-processing apparatus on future missions.

The firing was the first in a series of SPAR launches scheduled during the next five years. The project is managed by MSFC. Next flight is scheduled for the spring of 1976.

New Assistant Chief for Financial Operations at GSFC

Dr. John E. Green

Dr. John E. Green, Financial Manager for the Tracking Data Relay Satellite System, has been appointed Assistant Chief for Financial Operations at the Goddard Space Flight Center.

In his new position, Dr. Green will serve as a key advisor to management on financial and accounting matters, and will also participate in the development, coordination and improvement of financial systems and accounting operations.

Before coming to Goddard in May, 1974, Dr. Green was Director of Financial Management at the Federal City College in Washington, DC.

Public Affairs Officer Is Appointed

Alex P. Nagy, with NASA for the past 17 years, recently was named a Deputy Assistant Administrator, Office of Public Affairs.

Nagy's most recent post was Acting Director of the Planning and Media Development Division in Public Affairs, which has responsibility for publications, films and exhibits. Earlier assignments at NASA headquarters included administrative management positions in the Office for United Nations Conference and the Office of Manned Space Flight.

Before he came to NASA headquarters in 1960, Nagy was an administrative officer at the Beltsville Space Center (the predecessor of GSFC), where he worked on Project Vanguard, the first U.S. satellite program. Previously, Nagy had served with the U.S. Army and with the Naval Research Laboratory.

Satellite Data Studied for Snow Runoff Prediction

NASA now is cooperating in a project designed to analyze the usefulness of data gathered by space satellites for predicting the amount of water to be expected from melting snow in mountain areas of the western United States.

Four regions in California, Colorado, Oregon and Arizona are involved. Accurate predictions of snowmelt are important to them in planning the best use of water for power generation and irrigation, as well as for flood-control planning and estimating future water supplies for major cities.

Federal agencies in the program, besides NASA, include the National Oceanic and Atmospheric Administration, U.S. Geological Survey, U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, U.S. Soil Conservation Service and Bonneville Power Administration. Three state agencies—the Arizona Salt River Project, California Department of Water Resources and Colorado Division of Water Resources—are taking part.

NASA's role in the project is being coordinated by the Goddard Space Flight Center. Data from the Landsat spacecraft and NOAA weather satellites showing snow cover in mountain areas of the regions are being analyzed.

During the spring, data—primarily pictures—will be supplied water resources managers in the regions.

In the past, predictions have been based on observations from aircraft and limited measurements by observers penetrating remote wilderness areas on foot or land vehicles.

Did You Know?

Work is nearly complete on modification of a four-unit dwelling in a large housing cooperative in Greenbelt, MD, to permit the testing of a solar energy heating system installed on the roof. The Goddard Space Flight Center worked cooperatively with a local housing company to develop the thermal control system installed.

Use of solar energy to heat the homes is expected to reduce fuel oil consumption in the test structure by 50 percent. Amounts of fuel consumed by them will be compared with those recorded in nearby houses of identical construction except for the solar energy heating system.

A unique recording system—or sunfall monitor— that depends on terrestrial solar energy was installed recently at the Marshall Space Flight Center. It measures and records solar energy by means of sun tracking and stationary sensors. Accurate measurements of annual sunfall in contrasting areas and climates are useful to engineers and companies engaged in developing heating and cooling systems based on efficient use of solar energy.

The Marshall Space Flight Center recently requested quotations from industry for development of a flat conductor cable wiring system suitable for use in residences and commercial establishments.

The technology involved was developed by NASA to reduce the size and weight of electrical wiring in space vehicles. Several successful experimental installations of flat cable wiring systems for telephones and power have been made in offices, conference rooms, apartments and solar houses, and others are planned.

The Kennedy Space Center has awarded a $1,279,000 contract to the George A. Fuller Co., a division of the Northrop Corp. of Chicago, for fabrication and erection of a device for mating and demating the Space Shuttle Orbiter and NASA's Boeing 747 carrier aircraft at the Dryden Flight Research Center, which will be the Orbiter landing site after the first four missions.

A computer program that will provide a graphic presentation of a Space Shuttle launch has been developed at the Marshall Space Flight Center. It is expected to serve as a valuable tool for studying certain aspects of flight profile.

The program shows liftoff, solid rocket booster separation, external tank separation, and landing, each of which can be presented from various angles to give different views. In case of a problem at liftoff, it even shows the maneuver necessary to return to Earth and land, as well as the proper time to jettison the external tank.

The opening scenes of the television drama, "The Six-Million Dollar Man," which show a test pilot and his wingless craft crashing into a desert landscape, are real. They were taken in May, 1967, when test pilot Bruce Peterson was trying out the wingless M2F2 experimental lifting body at the Dryden Flight Research Center.

The footage came from cameras in the cockpit. Soon after the pictures were taken, the vehicle turned upside down and burst into flame. Peterson was badly injured, though not as severely as his TV counterpart. He suffered partial loss of sight in one eye, a broken hand, loss of teeth, a fractured skull, and virtually the total loss of his forehead. Rebuilding and rehabilitation took almost two years. He now is Director of Safety and Quality Assurance at Edwards Air Force Base.

NASA has asked the aerospace industry to study how the Space Shuttle may be used to transport a space station into orbit.

The agency plans to issue two $700,000 contracts in April for parallel 18-month conceptual studies, one managed by the Marshall Space Flight Center and the other by the Johnson Space Center.

Contractors will study low and synchronous orbit space station facilities of modular construction to begin in the mid-80s. Major emphasis will be placed on assuring inherent growth potential for the space station over a period of years.

A satellite was launched somewhere every three days in 1974, according to the International Telecommunication Union. The Soviet Union owns 95 of the 124 satellites involved. Eighteen of the spacecraft are partly or wholled owned by the United States. Other countries sponsored 11 launches.

The Kennedy Space Center launched 18 space vehicles during 1975, including seven Delta rockets, three Atlas-Centaurs, two Titan-Centaurs, five Deltas and one Saturn 1B. Launch totals for previous years follow:

1958—8; 1959—14; 1960—17; 1961—24; 1962—27; 1963—13; 1964—29; 1965—30; 1966—30; 1967—28; 1968—23; 1969—22; 1970—12; 1971—17; 1972—18; 1973—14; and 1974—10. ■ ■ ■ ■ ■

Standard Parts List Issued by NASA

As part of an agency-wide standardization program for the procurement of electronic parts, the first NASA Standard Parts List (MIL-STB-975) was distributed to all centers and contractors during January.

To limit the number of electronic parts to only those with adequate reliability and lowest overall cost, the list will be maintained and applied to both inhouse and contracted hardware for new programs.

Through standardization, NASA hopes to alleviate problems of small quantity buys, high costs, long delivery schedules, market influence and fluctuation, part failures and expensive rework.

The Marshall Space Flight Center has been designated the lead center in administering the program, in which the Department of Defense and its Defense Standardization Program are cooperating.

The initial list included capacitors, resistors, transistors, diodes and microcircuits which meet program criteria and are presently or potentially in demand by the various centers, according to Porter Dunlap, Chief of the NASA Standard Parts Lead Office at MSFC.

Dr. Flinn Made Chairman of New Commission

Dr. Edward A. Flinn

Dr. Edward A. Flinn, Deputy Director of Lunar and Planetary Programs at NASA Headquarters, has been appointed Chairman of a Commission on Planetary Sciences recently established by the International Union of Geodesy and Geophysics (IUGG) to coordinate meetings and exchange of information on geophysical aspects of planetary and terrestrial sciences.

Flinn joined NASA in January, 1975, as Director of Lunar Programs. He became Deputy Director and Chief Scientist of Lunar and Planetary Programs when the formerly separate lunar and planetary divisions of the Office of Space Science were merged in October, 1975. Since 1971, he has served the IUGG as Secretary of the Committee on Mathematical Geophysics. He currently is editor of the section of the *Journal of Geophysical Research*, a publication devoted to planetary surfaces and interiors.

In connection with the announcement of Flinn's appointment, it was pointed out that the study of the origin and evolution of the planets cuts across many disciplinary lines in geophysics. The new Commission will provide a focus within IUGG for those interested in planetology, thereby strengthening IUGG's ability to address fundamental problems related to the Earth and its place in the solar system.

Scientists cite that within the last few years, a great deal of detailed knowledge has been acquired about the Moon through the Apollo program, about Mercury and Venus through the Mariner 10 and the Soviet Venera missions, and about Jupiter from Pioneers 10 and 11. In the near future, similar advances will be made in knowledge of Jupiter and Saturn through the 1977 Mariner missions to those planets, as well as of Mars from the Viking missions scheduled to arrive there next summer. The comparative study of planetary bodies has thus become a vigorous and rapidly developing area of geophysics.

The Commission on Planetary Sciences will initially involve representatives from two of the seven international associations that make up IUGG—the International Association of Geomagnetism and Aeronomy and the International Association of Seismology and Physics of the Earth's Interior. It is expected that the other geophysical disciplines will be represented on the Commission early this year.

Initial members of the Commission include, in addition to Flinn, A. E. Ringwood, Professor of Geophysics at the Australian National University in Canberra; Donald M. Hunten of the Kitt Peak National Observatory in Arizona; S. Keith Runcorn, Professor of Geophysics at the University of Newcastle-upon-Tyne in England; Prof. O. Vaisberg of the Institute for Cosmic Physics in Moscow; and Prof. P. N. Kropotkin of the Institute of Geochemistry in Moscow.

Co-chairmen Appointed to Space Shuttle Program

Dr. J. A. Lovingood, of the Marshall Space Flight Center, and E. M. Jones, of the Johnson Space Center, have been named co-chairmen of a new technical working group in the Space Shuttle Program. Called the Space Shuttle Ascent Flight Systems Integration Group, the unit was formed in late 1975 to provide guidance and support to the technical management of the Shuttle mission's flight phase.

Lunchbox Forum Speakers Announced

Lou Casey, Curator of the Department of Aeronautics at the Smithsonian Institution's National Air and Space Museum, will be the speaker for the Museum's Feb. 18 Lunchbox Forum.

The Forum is held monthly in the Freer Gallery of Art Auditorium at 12th Street and Independence Avenue S.W. from noon to 1 p.m. All persons with an interest in areospace topics are invited.

In his talk, Casey will discuss the influence of Alan H. Curtiss, flight pioneer, in the early evolution of aircraft.

The schedule of speakers for the next three months follows:

March 17—Mel Zisfein, Deputy Director of the Space Museum, will discuss the X-16, a highly-specialized airplane. As the project was classified and later terminated, this will be the first public presentation.

April 21—Dr. Robert Wolfe, geologist, Center for Earth and Planetary Studies, Space Museum, will give a presentation of the new knowledge of the Moon gained through the Apollo Program, focusing on the study of lunar samples and lunar photography.

May 12—Herbert Frey, research assistant, Geophysics Branch, Goddard Space Flight Center, will probe the geophysical characteristics which Mars shares with both the Earth and Moon and will discuss distinct surface features of that planet.

The speaker for the Jan. 21 forum was Michael Collins, Director of the Museum, who explained similarities and differences between aircraft and spacecraft.

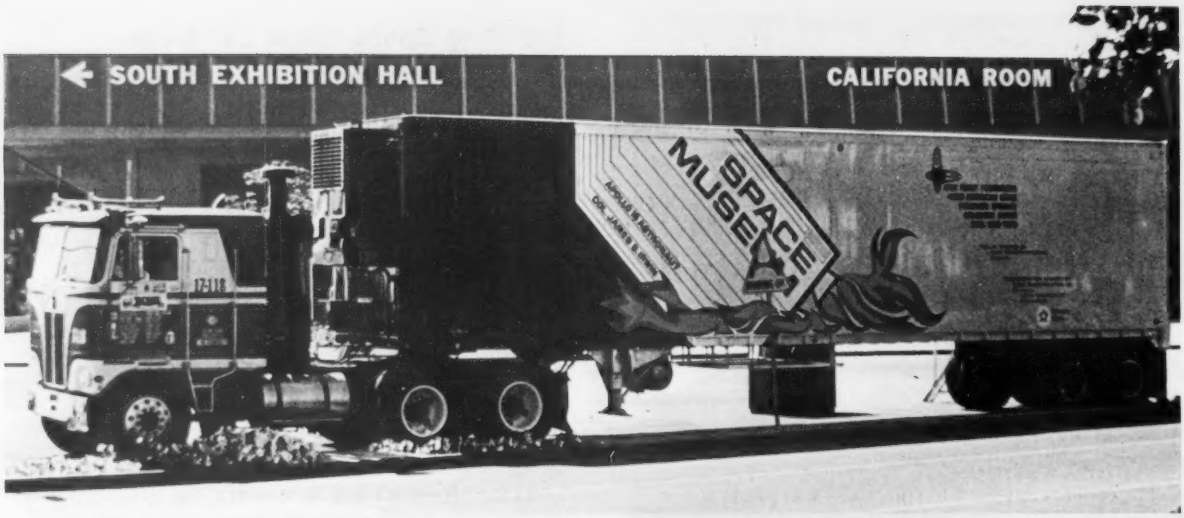
Traveling Space Show Celebrates Bicentennial Year

By the end of 1976, residents of 30 U.S. cities will have had the opportunity to view a large exhibit of objects, tools, photographs and films related to national accomplishments in space. The traveling exhibit, called the Mobile Space Museum, was prepared and is being sent around the country by the High Flight Foundation, a non-profit religious organization founded in 1972 by Col. James B. Irwin, Apollo 15 astronaut, now Chairman of the Foundation's Board. With Col. Irwin on the executive roster are fellow astronauts Col. William R. Pogue (Skylab 3) and Col. Alfred M. Worden (Apollo 15).

The Mobile Space Museum, open to the public free of charge, is endorsed by Colorado as a Bicentennial project.

As the Museum tours the country, the astronauts will present state flags flown to the moon to the various governors participating in Bicentennial celebrations.

FRC Visitor—Admiral Kenneth L. Woodfin (USN, Ret.), Assistant Administrator for Procurement for NASA, was a recent visitor at the Flight Research Center. This photograph was taken as he was being conducted on a tour of the Center by Larry Rucker (left), FRC Director of Procurement.



The High Flight Mobile Space Museum—Its exhibits of displays and pictures relate to the history of space travel and an astronaut's preparation for a voyage to the Moon. Museum officers call its message ". . . more than educational for it also contains a message of deep spiritual meaning to the inner man—a witness to the world and a challenge to every individual." The Museum is touring the U.S. during the Bicentennial Year.

Included in the exhibits inside the van are the Apollo spacesuit worn by Col. Irwin while he was on the surface of the Moon, an actual moon rock, several lunar tools, and pictures and films of the Apollo 15 lunar exploration. Much of the material on display is on loan from the National Air and Space Museum.

"I hope that everyone visiting the Mobile Space Museum will not only be able to relive Apollo 15, but will also feel some of the spiritual inspiration of that flight, remembering that our nation is one under God," Col. Irwin said.

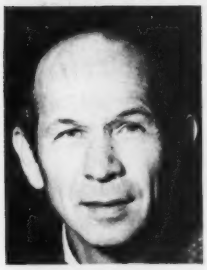
The traveling Museum, which so far has been seen in five cities in Kentucky and Florida, is scheduled to go on display as follows:: Feb. 10-15, Paris, TX; Feb. 17-22, Garland, TX; Feb. 24-29, Little Rock, AR; March 2-7, Sand Springs, OK; March 16-21, West Frankfort, IL; April 6-11, Mount Morris, MI; April 13-18, La Crosse, WI; April 20-25, Duluth, MN; May 4-9, Watertown, SD; May 11-16, Omaha, NB; May 18-23, Salina, KS; May 25-June 6, Colorado Springs, CO; June 8-13, Farmington, NM; June 15-20, Chandler, AZ; June 21-25, Eureka, CA; June 26-30, Marysville, CA; July 1-4, Sacramento, CA; July 5-7, San Francisco, CA; July 8-16, San Jose, CA; July 18-23, Bakersfield, CA; July 24-31, Torrance, CA; Aug. 1-7, Newport Beach, CA; Sept. 5-10, Amarillo, TX; Sept. 12-18, Lafayette, LA; Nov. 26-28, Indianapolis, IN.

Inquiries may be directed to High Flight Foundation, 4050 American Drive, Colorado Springs, CO. 80907 (303-598-7070).

Moonstruck Newsboy—Eight-year-old Scott Jones of Fredericksburg, VA, is plainly awed by his proximity to the spacesuit worn by Col. James B. Irwin on the Apollo 15 lunar exploration, which took place in 1971. The suit is part of a traveling exhibit of space articles, which was prepared and is sponsored by the High Flight Foundation, a non-profit religious organization based in Colorado. The Mobile Space Museum visited Fredericksburg during October.

Credit: ***The Fredericksburg Free Lance-Star.***

Dr. Faget Receives ASME Gold Medal



Dr. Maxime A. Faget

Dr. Maxime A. Faget, Director of Engineering and Development at the Johnson Space Center, was presented the Gold Medal of the American Society of Mechanical Engineers at its recent annual meeting in Houston.

The medal, established in 1920, was awarded Dr. Faget for "eminently distinguished engineering achievement." Previous JSC recipients include Dr. Christopher C. Kraft, Director, and his predecessor in that office, Robert R. Gilruth.

Faget has been Director of Engineering and Development at JSC since 1961. He was responsible for the design, development and environmental testing of the Mercury, Gemini and Apollo spacecraft, the Skylab space station, and the Space Shuttle.

In 1973, in recognition of his outstanding contribution to space research and exploration during the preceding five years, he was presented the Daniel and Florence Guggenheim International Astronautics Award by the International Academy of Astronautics. Last year, he was rewarded by NASA for his role in preparing the sunshade that permitted the Skylab to carry out its successful mission.

Born in British Honduras, Faget was graduated in mechanical engineering from Louisiana State University and joined the National Advisory Committee for Aeronautics, NASA's predecessor, in 1946 as a research scientist. In 1958, he was one of the original group of 35 engineers assigned as a Space Task Group that became the nucleus of the Johnson Space Center. He originated the one-man spacecraft used in Project Mercury.

Richard S. Johnson Leaves JSC

Richard S. Johnston, Director of Life Sciences at the Johnson Space Center, has resigned from NASA to join the Bunker Ramo Corp. of Oak Brook, IL, as assistant to the president.

Bunker Ramo Corp. is an international manufacturer of electronic components, information systems, and knitted deep-pile fabrics. Its president is George S. Trimble, former JSC deputy director.

Johnston began his federal service career in 1946 when he joined the U.S. Naval Research Laboratory in Washington, DC, where he was a research chemist. He next worked with the U.S. Navy Bureau of Aeronautics and then, in 1959, transferred to the NASA Space Task Group at Langley Field, VA, later becoming chief of the Manned Spacecraft Center (now JSC) Crew Systems Division. In 1968, he was made special assistant to the JSC director. Two years later, he was appointed deputy director of JSC Medical Research and Operations and, in 1972, became director of Life Sciences.

KSC Awards Dome Rental Contract

Charter Industries, Inc., of Raleigh, NC, has been awarded a $265,000 contract by the Kennedy Space Center for the one-year rental of 14 geodesic domes to house displays at the Government-sponsored Bicentennial Exposition on Science and Technology to be held at KSC this summer.

Exhibits will show how science and technology will be applied during the next 200 years for a better life in the United States. So far, 16 Government agencies have announced plans to participate in the exposition, scheduled to open Memorial Day and continue through Labor Day.

Computer Software System to Be Developed

The Boeing Commercial Airplane Company of Seattle, WA, has been selected by NASA for negotiation leading to the award of a contract to develop a computer software system that should substantially reduce both the time spent in the design of aircraft and space vehicles and the costs involved. Improvements in vehicle performance also can be expected.

The system is designed at Integrated Programs for Aerospace-Vehicle Design (IPAD). It will be an engineering information processing system to be installed on computer complexes of major U.S. aerospace companies. Boeing's proposed cost for the five-year, cost-plus-award-fee contract is about $9.8 million.

Model Used to Reveal Flight Characteristics of Shuttle Orbiter

The leisure-time hobby of John Kiker of the Johnson Space Center's Spacecraft Design Division, who has been building and flying model aircraft since he stopped piloting full-size airplanes in 1963, may provide some indication of Space Shuttle Orbiter flight characteristics.

He has modified a 1/40th scale Orbiter model used in earlier flotation tests and launches it from atop a gas-powered radio control model airplane. A radio signal separates the Orbiter from the carrier aircraft at the desired altitude, and a second radio transmitter allows the Orbiter to be flown to its dead-stick approach and landing.

The full-size manned Orbiter, now in final assembly at Rockwell International's plant at Palmdale, CA, will be released from atop a modified Boeing 747 jet transport sometime in 1977 at Dryden Flight Research Center

to glide down to landings as a prelude to the first orbital flight in 1979.

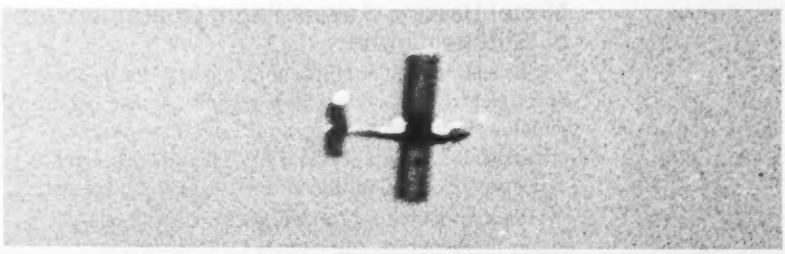
Kiker made the Orbiter model modifications in his home shop and uses his personal radio control equipment.

"I believe radio control scale models are a good means of providing an initial indication of Orbiter control characteristics and separation dynamics before you start flying the real thing with live pilots," he said.

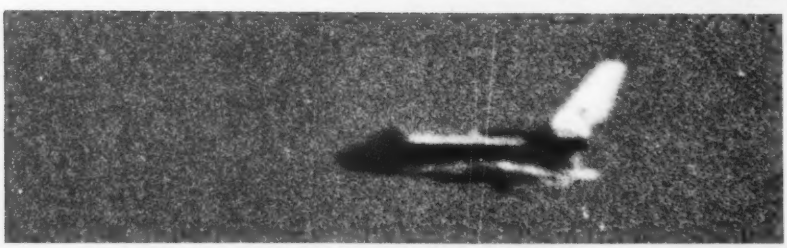
Kiker is internationally known for his radio control model activity.

A 1/40th-scale Space Shuttle Orbiter, built originally for flotation tests, is prepared for flight on the NASA Johnson Space Center Antenna Test Range. At left Art Arro and Owen Morris make final preflight adjustments to the carrier aircraft and Orbiter model while John Kiker cycles control surfaces with the radio control console.

Following takeoff and a low-level flyby, the carrier aircraft climbs to drop altitude for radio-commanded Orbiter release.



Orbiter model is released from pylon on carrier aircraft.



Orbiter model is steered to landing by radio signals driving elevon actuators.

Personality Feature:

Lady Engineer on Headquarters Staff

Barbara Williams

Barbara Williams, a recent addition to the staff of the Office of Applications User Affairs Office, has been assigned to NASA for a one-year tour of duty by the President's Executive Interchange Program. She is the first black woman ever chosen by the prestigious Interchange Program to fill an executive job with the Federal Government as a representative of private industry.

The lady comes to NASA from IBM (at Mohansic, N.Y.), where she was a program manager in the Advanced Systems Development Division. Part of her duty in 20 years of engineering experience involved helping to design components for the Apollo guidance control system, a fact that makes it easier for her to adjust to a new position and a new boss, Rusty Schweickart, in charge of the Office of User Affairs.

"I'm very pleased to get to know one of the Apollo astronauts and even more pleased to be working with one of them," she says.

The President's Executive Interchange Program, now six years old, provides a vehicle by which mid-career executives within the business world are given an opportunity to work temporarily in responsible positions in the Federal bureaucracy. Selected executives such as Williams bring with them the talents and experience of the profit environment and apply them to the operational problems and challenges of Federal programs. They seek to improve procedures, contribute to efficiency, and advance the Government's responsiveness to its citizenry. At the same time, these business executives learn the decision-making processes of national government. They meet the decision-makers, talk with them, observe how they think; and, in the ordinary course of executive events, they learn at close range how the Government operates, how public policy is formulated, and how industry and Government interact.

To date, Williams has met and talked with Agriculture Secretary Earl Butz, HUD Secretary Carla Hills, Transportation Secretary William T. Coleman, Jr., Senator Ted Kennedy, Washington *Post* Executive Editor Ben Bradlee, and *Time* senior correspondent Hugh Sidey, among others.

So far, almost every Federal Government department and agency has participated in the program, in which the industry-to-Government exchange procedure also works in reverse—upward-bound Federal executives are sent into the private sector on temporary assignments, later to return to Federal jobs. More than 120 firms in private industry have taken part in the program, including General Electric, IBM, the Bank of America, Shell Oil, Marathon Oil, Hewlett-Packard, Dow Chemical, AT&T, Rockwell International, and International Paper.

Ms. Williams began her year-long stint last September as manager of Market Requirements and Planning in User Affairs. Her duties, in general, encompass the identification of the requirements and the development of strategies that can build a bridge between users of space technology and the NASA Office of Applications. The broad objective of the Office of User Affairs is to establish a common meeting ground between itself and the individuals, companies, and other organizations that have a need for space-developed products and services. Personnel in User Affairs seek to strengthen a two-way communication in which user needs are represented to NASA, and either users or potential users are made aware of NASA achievements, and their value and benefit.

As is customary with exchange executives, nominating companies agree to re-employ the selected individuals at better jobs with greater responsibility at the end of the transferee's year of duty, to pay moving expenses, and to continue company benefits—other than stock and salary. (Salaries are paid by the host organizations.) In Williams' case, her salary as set by the Civil Service Commission is lower than her IBM earnings. A strong believer in individual initiative, she sees her assignment as a great opportunity—"an investment in the future," she says. Williams believes most definitely that she and her Exchange Program colleagues will return to their jobs in Government and in private industry with broadened perspectives and insights, and that their better understanding of each other's problems and objectives will be of great value to both.

Though a relative newcomer to NASA, Williams is—and has been for some time—an ardent admirer of the space program and a forthright spokesperson for its principles. She points out that her work in the past has often been in interaction with NASA projects and thus has given her something more than a layman's understanding of some of the agency's programs and objectives. She believes strongly that ". . . the money NASA spends on space exploration has a profound effect on the national economy as a whole, in the form of more jobs, more marketable products, the creation of whole new fields of endeavor . . ." and that "many of the urgently needed solutions to problems on earth will be found as a direct result of solutions reached by scientists and engineers to problems encountered in space research. We've already seen such results where some of the 'closed systems' created for satellites have been adapted for earthbound usage."

She grew up in New Monmouth, a small town in rural New Jersey, graduated from the Middletown Township High School, and went on to study engineering physics at Cornell. (An excellent student in mathematics and science, she obtained a rare non-resident scholarship to the New York university through a circuitous series of events, beginning with a letter she wrote to Mrs. Eleanor Roosevelt.) She left the university to go to work as an engineering aid with the Signal Corps Engineering Laboratories at Fort Monmouth, N.J., and later enrolled in Hunter College after moving to New York. She earned a B.A. degree in political science ("More for fun than anything else," she says. "*Everybody* would benefit from taking a course or two in the political sciences").

She joined the IBM Corporation in 1965, beginning as a systems engineering trainee, and advancing through the ranks of associate systems engineer, instructor, advisory product analyst, and systems engineering manager, to her last position in advanced systems before she came to Washington. She is also an expert on computer systems.

Barbara Williams is enjoying her life in Washington and her job with NASA. As she sums it up: "All the right ingredients are present—beauty (Washington is a lovely and exciting city), culture, intellectual stimulation, and professional challenges. It's a marvelous opportunity for growth."

And then, in a change of mood, she flashes a wide and ingenuous smile as she asks the rhetorical question: "How can I lose? I've got everything going for me—I'm black, I'm female, and I'm forty!"

Where Are Our Spaceships?

The following article, under the above headline, appeared in the Dec. 11, 1975, issue of the Kennedy Space Center's "Spaceport News":

What goes up must eventually come down. Right?

Wrong! That old saying was permanently laid to rest in 1959 when the Soviet Union's Lunik 1 and America's Pioneer 4 spaceships went up and didn't come back. For that matter, they never will.

But this is only part of the overall story. According to the latest box score, man has flung over 1,700 "stones" into the heavens since the Space Age blossomed nearly two decades ago, and more than 700 of them are still out there.

The U.S. tally, counting launches for other nations and organizations, is 829 ups and 404 downs, leaving a balance of 425 AWOL spacecraft—most of them last seen at KSC launch pads in Florida and California.

This raises an interesting question: Where are our missing spaceships?

The majority are scientific, communications and meteorology satellites whirling around the Earth in orbits ranging from less than 100 miles to thousands of miles. Between 40 and 50 are still functioning and carry familiar names such as Explorer, ATS, Westar, Intelsat, SMS, Nimbus, Landsat and OSO. Like their now-silent cousins, they will someday return to Earth in a fiery death.

Forty-three spaceships have bid an eternal farewell to Earth. They include 25 that now claim the Moon as home; 13 that have become solar-orbiting gypsies; three that have staked out future claims on Mars; one that is heading for a rendezvous with the stars of the galaxy; and one whose future course is yet undecided.

The Moon is by far the largest collector of wayward NASA spaceships. Its surface is littered with the intact or crashed remnants of the following craft:

6 Rangers—launched between April 1962 and April 1965. Rangers 4 and 5 were unsuccessful and missed their target points on the lunar surface. Ranger 6 made its target but failed to transmit any photos before crashing at 6,000 mph. Rangers 7, 8 and 9 returned excellent photos of the surface during their 20- to 25-minute suicide dives.

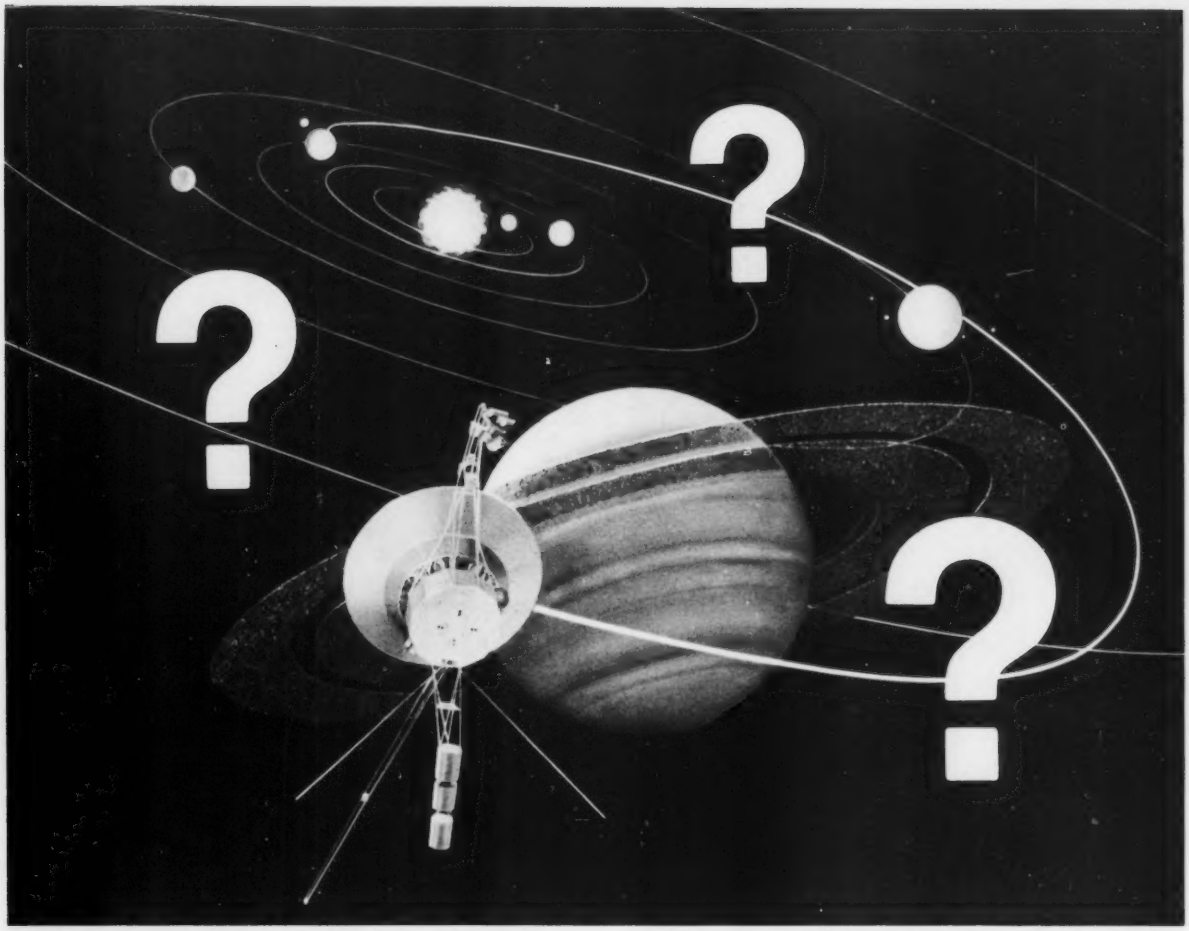
7 Surveyors—launched between May 1966 and February 1968. Of the seven, all were successful except Surveyor 2, which crashed during its soft-landing attempt and Surveyor 4, which landed safely but failed to transmit data and photographs.

5 Lunar Orbiters—launched between August 1966 and September 1967. All five Orbiters performed excellently and returned thousands of photographs to pave the way for the Apollo lunar landings. After completing their missions, the Lunar Orbiters were deliberately crashed onto the Moon's surface.

7 Lunar Modules—launched during the Apollo Lunar Landing Program. Of eight Lunar Modules carried to the Moon by Apollo spacecraft, only LM-7 (Apollo 13) returned toward Earth. After serving as a "lifeboat" for the crew during the aborted lunar mission, it was discarded and subsequently burned up on reentry into the Earth's atmosphere. The other seven LMs completed their lunar missions and were commanded to crash onto the Moon. Also left behind on the lunar surface was an assortment of Apollo equipment, some still functioning, and three Lunar Rovers.

The Sun has staked the next largest claim on NASA spacecraft. Pioneers 4 through 9, launched between March 1959 and December 1968, are in sweeping solar orbits. Amazingly, Pioneers 6 through 9 are still working. In fact, Pioneer 6 celebrated its tenth anniversary on December 16.

Other solar wanderers include Mariners 2 and 5 (Venus flybys), launched in August 1962 and June 1967; Mariners 4, 6 and 7 (Mars flybys), launched in November 1964, February 1969 and March 1969; Mariner 10 (Mercury/Venus flyby), launched in November 1973; and the German-built Helios 1 Sun probe launched December, 1974.



Mariner 9, launched in May 1971, has been orbiting Mars since 1972. The now-dead spaceship will crash on the Martian surface in about 50 years. Vikings 1 and 2 will land on the surface of Mars next summer and take up permanent residence.

Pioneers 10 and 11 are in an entirely different category. They might best be described as spaceships without a solar system to come home to. Pioneer 10, for example, zipped past Jupiter in December 1973 at a velocity of 81,000 mph. Its speed, coupled with the slingshot effect of Jovian gravity, will take it out of the solar system towards the star Aldebaran. The journey will take 1.7 million years.

Pioneer 11 sizzled past Jupiter in December 1974 at a velocity of 107,000 mph. Its speed and Jupiter's gravity whiplash altered its path toward a rendezvous with ringed Saturn in September 1979. Scientists are presently trying to decide whether the spaceship should be guided past Titan, a moon of Saturn, or between the planet and its colorful and mysterious rings. The mid-course correction maneuver, when it comes, will decide Pioneer 11's fate—solar orbit or escape from the solar system.

Aircraft Maneuver Facility—Newest addition to the skyline at Ames Research Center is this ten-story structure that will house a new facility to simulate critical maneuvers of aircraft during takeoff and landing. Called the Vertical Motion Simulator (VMS), it will provide up-and-down motions to simulate similar movement by aircraft such as the new Short Takeoff and Landing (STOL) and Vertical Takeoff and Landing (VTOL) vehicles of the future. Research pilots, riding in a simulator cab which can be configured to simulate various aircraft, will experience vertical excursions of up to 18 meters (60 feet) and 12 m. (40 ft.) horizontally. The VMS, scheduled to be completed in late 1976, is more advanced than any system now in existence and will for the first time have the ability to simulate accurately flare and touchdown of aircraft.

Radio-Television

(*Released nationally*)

TELEVISION: A color film released in the *Aeronautics and Space Report* monthly film series: "A Is for Aeronautics," (4½-min. and 90-sec. versions).
RADIO: Four weekly *Space Story* programs have been released —"Flat Cable Conductors," (MSFC/James Hankins); "Aircraft Fuel Reduction," (Hdqrs./James Kramer); "Viking Search for Life," (Dr. Lynn Margulis); and "NASA-Coast Guard Firefighting Module," (MSFC/Aubrey Smith). One monthly NASA *Special Report*, "Viking to Mars: Weather Watching on the Red Planet's Surface," (Dr. Seymour Hess/Viking Meteorology Team Leader).

Lunar Sample Exhibits

The following is a schedule of lunar sample exhibits from Jan. 15 to Feb. 15, 1976:

OHIO—Indian Hill School Bicentennial Program, Cincinnati, Feb. 3-13
TEXAS—Houston Museum of Natural Science History, End of Caroline at Hermann Park, Houston, Jan. 15, Feb. 15
AMERICAN FREEDOM TRAIN—Phoenix, AZ, Jan. 17; Albuquerque, NM, Jan. 28; San Antonio, TX, Feb. 5; Austin, TX, Feb. 12
HIGH FLIGHT FOUNDATION BICENTENNIAL MOBILE SPACE MUSEUM—Sarasota, FL, Jan. 15-18; AL, Jan. 20-25; MS, Jan. 27-Feb. 1; LA, Feb. 3-8; Paris, TX, Feb. 10-15
TENNESSEE VALLEY ASSOCIATION-BICENTENNIAL CARAVAN ITINERARY—Andalusia, AL, Jan. 15; Enterprise, AL, Jan. 16-17; Dothan, AL, Jan. 18-20; Eufaula, AL, Jan. 21; Opelika-Auburn, AL, Jan. 22-23; Montgomery, AL, Jan. 24-27; Sylacauga, AL, Jan. 28; Gadsden, AL, Jan. 29-30; Birmingham, AL, Jan. 31-Feb. 1-4; Cullman, AL, Feb. 5; Decatur, AL, Feb. 6; Huntsville, AL, Feb. 7-9; Scottsboro, AL, Feb. 10; Lafayette, GA, Feb. 11; Rome, GA, Feb. 12-13; Dalton, GA, Feb. 14; Dahlonega, GA, Feb. 15.

Long Term Displays

ALABAMA—Alabama Space & Rocket Center, Marshall Space Flight Center, Huntsville
FLORIDA—Visitor Information Center, Kennedy Space Center
KANSAS—Eisenhower Library, 200 SE 4th St., Abilene
NEW YORK—United Nations Building, New York City
OHIO—USAF Museum, Wright Patterson AFB
TEXAS—Johnson Library, University of Texas, Austin; Visitor Information Center, Johnson Space Center, Houston
VIRGINIA—Visitor Information Center, Langley Research Center, Hampton
WASHINGTON, D.C.—National Geographic Museum; Smithsonian Institution, National Air and Space Museum, 1000 Jefferson Drive; Washington National Cathedral.

Projected Launch Schedule

(As of December 31, 1975)

Name	Launch Date	Vehicle	Range	Mission Remarks
NATO-IIIA	Feb. 12	Delta	ETR	Communications satellite in synchronous orbit to perform communications relay for NATO. Reimbursable.
RCA-B	March 24	Delta	ETR	Second domestic communications satellite for RCA. Reimbursable.
Comstar-A	March	Atlas Centaur.	ETR	Domestic communications satellite for Comsat Corp. Reimbursable.
Marisat-A	Not set	Delta	ETR	Comsat Corp. satellite to provide maritime communications services. Reimbursable.
ITOS-E2	Not set	Delta	WTR	Operational meteorological satellite of the National Weather Service to provide daytime and nighttime cloud cover imagery. Reimbursable.
LAGEOS	1st Quarter	Delta	WTR	Demonstrate relevant space techniques that will contribute to the development and validation of predictive models for earthquake hazard alleviation, ocean surface conditions and ocean circulation.
Relativity (Gravity Probe)	Not set	Scout	WTR	Scientific satellite to make a test of Einstein's Theory of Relativity.
Air Force	May	Scout	WTR	USAF Scientific Payload, Reimbursable.
Marisat-B	May	Delta	ETR	Second Comsat Corp. satellite to provide maritime satellite communications services. Reimbursable.
Comstar-B	May	Atlas Centaur.	ETR	Second domestic communications satellite for Comsat. Reimbursable.
Navy Transit	2nd Quarter	Scout	WTR	Navy navigation satellite. Reimbursable.
Indonesia-A (Palapa)	July	Delta	ETR	Indonesian communications satellite. Reimbursable.
NATO IIIB	Aug.	Delta	ETR	Communications satellite in synchronous orbit to perform communications relay for NATO. Reimbursable.
ITOS-H	4th Quarter	Delta	ETR	Operational meteorological satellite to provide daytime and nightime cloud cover imagery for NOAA. Reimbursable.
RCA-C	Oct.	Delta	ETR	Third domestic communications satellite for RCA. Reimbursable.
GOES-B	Nov.	Delta	ETR	Second operational satellite to provide continuous day and nighttime global cloud cover observations for NOAA. Reimbursable.
Marisat-C	Dec.	Delta	ETR	Third Comsat Corp. satellite to provide maritime satellite communications services. Reimbursable.
Intelsat-IVA-C	Dec.	Atlas Centaur	ETR	Third of a series of improved intelsat Consortium satellites. Reimbursable.

Patents for Inventions from NASA Research

(The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel for the indicated installation.)

Inventor(s) and Employer(s)	Title and NASA Docket	Patent No.	Installation
Edward J. Nossen and Eugene R. Starner, RCA/David Sarnoff Research Center, Princeton, NJ	Frequency Measurement by Coincidence Detection W/Standard Frequency (MSC-14,649-1)	3,924,183	JSC
Russell A. Lindberg, NASA/LeRC	High Temperature Capacitor (LEW-11,938-1)	3,924,164	LeRC
Leon Peters, Jr., and Carl A. Mentzer, Ohio State University, Columbus, OH	Horn Antenna Having U-Shaped Corrugated Slots (LAR-11,112-1)	3,924,237	LaRC

Harry E. Peters, NASA/GSFC	Atomic Standard with Variable Storage Volume (GSC-11,895-1)	3,924,200	GSFC
Donald A. Kugath, General Electric, Schenectady, NY, and Herman T. Blaise and Dan H. Dane, NASA/MSFC	Remote Manipulator System (MFS-22,022-1)	3,923,166	MSFC
Melvin M. Saffren and Daniel D. Elleman, Caltech/JPL, Pasadena, CA	Magnetometer Using a Super-conducting Rotating Body (NPO-13,388-1)	3,924,176	NaPO
Phillip D. Potter, Caltech/JPL	Dichroic Plate (NPO-13,506-1)	3,924,239	NaPO
Donald L. Alger, NASA/LeRC	Deuterium Pass Through Target (LEW-11,866-1)	3,924,137	LeRC
Ray E. Marlow, Sperry Rand Corp., Space Support Div., Huntsville, AL	Remotely Operable Articulated Manipulator (MFS-22,707-1)	3,922,930	MSFC
George R. Proch, Lockheed Electronics Co., Inc., Houston Aerospace Systems Div. Houston, TX	Low Distortion Receiver for Bi-Level Baseband PCM Waveforms (MSC-14,557-1)	3,924,068	JSC
Norman I. Holt, Caltech/JPL	Scan Converting Video Tape Recorder (NPO-10,166-2)	3,924,267	NaPO
Joseph S. Heyman, Washington University, and James G. Miller, NASA/LaRC	Ultrasonic Calibration Device (LAR-11,435-1)	3,924,444	NaPO
Ralph D. Thomas, NASA/LeRC	Thermocouple Tape (LEW-11,072-2)	3,925,104	LeRC
James A. Webster, Monsanto Research Corp., Dayton, OH	Polyimides of Ether-Linked Aryl Tetracarboxylic Dianhydrides (MFS-22,355-1)	3,925,312	MSFC
Siegfried O. Auer, National Academy of Science, Washington, DC	Micrometeoroid Velocity and Trajectory Analyzer (GSC-11,892-1)	3,927,324	GSFC
Frederick T. Schuller and Warren A. Moore, NASA/LeRC	Journal Bearings (LEW-11,076-4)	3,926,482	LeRC
Wayne M. Phillips, Caltech/JPL	Cermet Composition and Method of Fabrication (NPO-13,120-1)	3,926,567	NaPO
David E. Pitts, NASA/JSC	Space Mirrors (MSC-12,611-1)	3,927,227	JSC
Richard F. Schmidt, NASA/GSFC	Single Frequency, Two Feed Dish Antenna Having Switchable Beamwidth (GSC-11,968-1)	3,927,408	GSFC
George M. Fohlen, John A. Parker and Paul M. Sawko, NASA/ARC	Transparent Fire Resistant Polymeric Structures (ARC-10,813-1)	3,928,708	ARC
Edward L. Shriver, NASA/MSFC, and Dr. Edward B. Igenbergs, National Academy of Science	Self-Energized Plasma Compressor (MFS-22,145-2)	3,929,119	MSFC
Claude T. Haley, NASA/LaRC	Clock Setter (LAR-11,458-1)	3,929,364	LaRC
Alexander P. Sabol, NASA/LaRC	Heat Exchanger System and Method (LAR-10,799-2)	3,929,305	LaRC
Maxime A. Faget, William W. Petynia and Willard M. Taub, NASA/JSC	Space Vehicle System (MSC-12,561-1)	3,929,306	JSC

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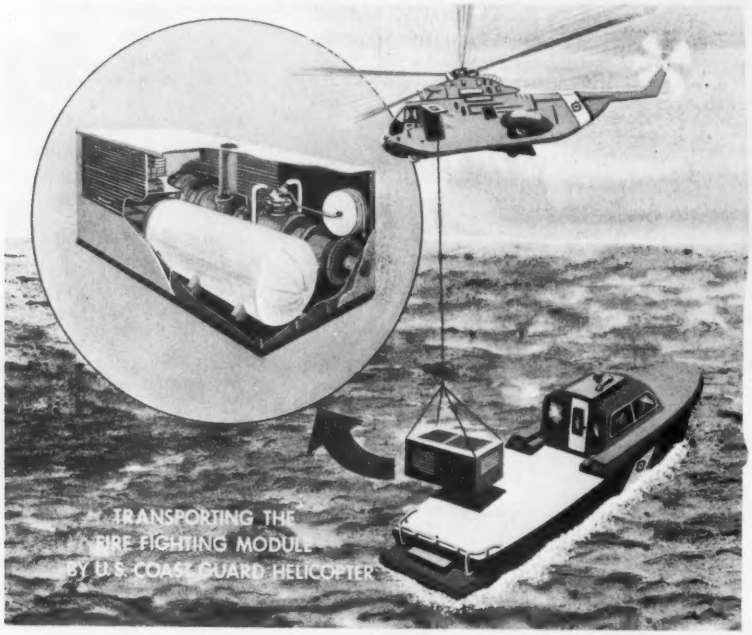
Action to Bring About Better Equipment for Fighting Shipboard and Dock Fires

The seaman's prayer for effective equipment with which to fight fire on board ship at sea or while docked in port may soon be answered. NASA and the U.S. Coast Guard are working jointly on a project that has such a goal as its objective.

What is planned is a module that is completely self-contained. As projected, it can be lifted by helicopter or dock crane onto the deck of almost any type of craft. It will have its own pumps, hose, fire-fighting suits, and other necessary equipment. And it will be able to pump water from the sea at a rate of up to 2,000 gallons-per-minute for periods of at least three hours.

NASA was asked by the Coast Guard to participate in the undertaking because of its broad experience with high-capacity, lightweight fuel pumps developed for rocket engines.

The project is directed by the Marshall Space Flight Center's Technology Utilization Office. Construction of the prototype started early this year. Tests are expected to begin in about 18 months. It is planned to make the module available eventually to fire departments throughout the country.



TRANSPORTING THE FIRE FIGHTING MODULE BY U.S. COAST GUARD HELICOPTER

U.S. COAST GUARD FIRE FIGHTING MODULE

NASA

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